Sea Turtle Program Overview
Southeast Fisheries Science Center
Miami Laboratory
Protected Resources and Biodiversity Division

Summary of primary ongoing and proposed (funded) sea turtle research and monitoring activities for sea turtles, including international research and monitoring activities, if applicable:

STSSN (Teas)
The Sea Turtle Stranding and Salvage Network (STSSN) serves to document dead or injured sea turtles along the coasts of the eastern United States. The STSSN relies on a trained group of volunteers, including state and federal employees and private individuals, to collect basic biological data on each individual located. Each animal is identified to species, the condition or state of decomposition is determined, standard carapace measurements are taken and any obvious wounds, injuries or abnormalities are described. Volunteers who have received additional training may also perform necropsies on a carcass to determine the general state of health of the animal prior to death, determine sex and locate any obvious internal abnormalities. Data are recorded on standardized report forms that are submitted first to a state coordinator in the state the carcass was found, and then to the national STSSN coordinator at the National Marine Fisheries Service, Southeast Fisheries Science Center.

Systematic surveys (weekly or biweekly) are contracted for some areas of Texas and Louisiana that would not otherwise be routinely checked for strandings. These surveys help to provide a baseline so that elevated stranding levels can be responded to in a timely manner. Contracts are currently in place with the University of Texas, Pan American for surveys on South Padre Island and Boca Chica Beach near the Mexican border, Padre Island National Seashore (PINS) for surveys on PINS and coordination of the STSSN network in Texas, University of Texas, Port Aransas for surveys on Mustang and San Jose Islands, and McNeese State University for surveys in western Louisiana. The NMFS Galveston Laboratory has also received RPS funding to systematically survey the upper Texas coast on a weekly basis. All other SEFSC laboratories participate in the STSSN in their local areas documenting strandings as needed.

The STSSN also collects samples for NMFS funded projects. Genetic samples are collected and sent to the National Genetics Laboratory at the SWFSC. Flippers (humerii) and eyeballs are collected and sent to the National Aging Laboratory at the NMFS Beaufort Laboratory. Flippers from Kemp's ridleys are collected and scanned for internal wire tags placed in hatchlings at Rancho Nuevo by the NMFS Galveston Laboratory as part of a research study to determine the length of time Kemp's ridleys spend in pelagic habitat before recruiting to benthic habitat. Samples are also collected for other research projects as requested.

CMTTP (Epperly)
The CMTTP was maintained at the National Marine Fisheries Service (NMFS) Southeast Fisheries Science Center (SEFSC) beginning in 1980, when there were several entities purchasing, distributing, and applying tags to sea turtles. From 1980 to 1999, 142,000 inconel, monel, and plastic tags were distributed, and approximately 7500 recaptures were reported. By

early April 1999, there were two sea turtle tag distribution centers in the southeast U.S.: NMFS SEFSC and the University of Florida Archie Carr Center for Sea Turtle Research (ACCSTR). The ACCSTR distributed tags to many collaborators in all areas of the world since 1955, having distributed over 220,000 tags. The ACCSTR has established an internationally known database system and communication network, where individuals communicate throughout the world with local fishermen and other citizens to arrange for the return of tags from captured turtles. In April 1999, the activities of the two groups were consolidated, transferring NMFS' CMTTP management to the ACCSTR. This eliminated the duplication of necessary infrastructure, saving federal dollars, and minimized the duplication of tag identification numbers among programs and the confusion associated with returning recovered tags to two separate entities. The transfer has also allowed partial recovery of tag and applicator costs, as organizations are requested to reimburse the ACCSTR for tags and applicators when possible, so that fewer federal dollars are required to purchase tags and applicators. The ACCSTR purchases and distributes tags, maintains records of tag distribution, enters recapture data and maintains the database. ACCSTR has maintained a web site for the CMTTP [http://accstr.ufl.edu/cmttp.html].

Leatherback Telemetry (Sasso)
The SEFSC Miami Laboratory conducts research on behavior, movement, and survival through the deployment of satellite tags. Archival and conventional satellite tags are used in this research depending on the specific question being asked. To date, satellite tags have been deployed on Florida nesting leatherbacks. Future satellite tagging is planned for leatherbacks in the Gulf of Mexico, an area with high levels of fishery interactions.

Loggerhead Post-Hooking Survival Studies (Epperly)
Popup Archival Transmitting (PAT) tags are used in survival studies. They are designed to provide information on the fate of the animal – more so than conventional satellite tags. We developed a new attachment methodology for cheloniid sea turtles. In May 2003, disabled PAT tags were attached to three ~50 cm SCL loggerhead turtles (*Caretta caretta*) of the 2000 year class held in captivity at the NOAA Fisheries Galveston Laboratory. Attachments were monitored daily, photographed weekly, and removed a year later. The posterior carapace of each animal was scanned radiographically using computer-assisted tomography (CT), and the radiographs were evaluated for the long-term impact of the attachment on the underlying bone. There was no evidence of significant reaction to the attachment.

We also conducted a feasibility study of using PAT tags for a full survival study of sea turtles. After deciding that the post-hooking mortality of sea turtles likely would not be expressed in a short amount of time, we selected the Wildlife Computer PAT tags because of their ability to collect data every minute, summarize the data from a long period of deployment into histograms of durations defined by the user, and transmit them after popup. We deployed 39 tags on wild loggerhead turtles in the North Atlantic. Most had interacted with the pelagic longline fishery, but some were control turtles dip netted from the surface. We monitored the fate of these turtles for up to 1 year and assessed our ability to use this technology in sea turtle studies. Over 40% of the tags remained attached until the popup date, indicating those animals had survived. About 30% of the tags never transmitted data and the remainder popped up prematurely. A few premature releases were categorized as mortalities, but the fate of most of the premature releases

could not be determined. We also evaluated tag performance. We have submitted a proposal to the Advanced Sampling Technology Working Group for FY06 funding to continue this work.

Virginia Key Nesting Beach Survey (Teas)
Early morning surveys are conducted daily from mid-April through end of September to document nesting activity on Virginia Key (where Miami Lab is located). Surveys began in 1990 and have continued through 2005. Location of each turtle emergence (nest or false crawl) is documented and nest locations are triangulated using distance and bearing from a fixed point and are left in place unless threatened by tides. After hatchling emergence, nests are excavated to document hatch and emergence success. Genetic samples are collected from dead hatchlings and/or embryos remaining in nest. All nest predation and hatching disorientation events are documented. Data is provided to the Florida Fish and Wildlife Conservation Commission for inclusion in statewide nesting beach survey program. Approximately 15-20 Southeast Fisheries Science Center employees from various programs volunteer each year to participate in these surveys, making this a lab-wide effort.

Atlantic Strategy and Bycatch Analysis (Richards)
The science centers' role on the Atlantic strategy involves processing data requests from HQ. Bycatch analysis continues for the pelagic longline, shark bottom longline and shark gillnet fisheries as mandated by recent biological opinions. In addition, we are exploring alternative methods of analysis to reduce bias in the data. Of primary concern is determining the most useful explanatory factors of sea turtle bycatch in the pelagic longline fishery. Bycatch analysis of the North Carolina pound nets is also ongoing, and we are currently working on a manuscript using this data as an index of sea turtle presence in Pamlico Sound. We also plan to complete a full analysis of the extrapolated bycatch and mortality for loggerhead, green, and Kemp's ridley sea turtles with respect to the pound net fishery. We anticipate beginning analysis on sea turtle bycatch in the shark drift gillnet and shark bottom line fisheries in the summer of 2006.

Aerial Surveys (Richards)
Aerial surveys of sea turtles and marine mammals have recently been completed in the western Atlantic nearshore of the US. These will be analyzed for sea turtle density in collaboration with the marine mammal division. We also plan to do a comprehensive analysis of the data sets to explore the possibility of generating a time series of sea turtle density estimates.
Demographic and ecosystem research (Richards)
We developed three proposals to work on green and hawksbill sea turtles and their role in the coral and sea grass ecosystems. These were not funded but we will continue to look for opportunities for funding. We are especially interested in conducting research that could elucidate important demographic parameters such as growth and juvenile survival, as well as research on movement and habitat use.

Modeling (Richards)
Paul Richards has been exploring the use of mechanistic models as well as traditional demographic modeling approaches for heuristic population dynamical examinations of the impacts of bycatch, the prioritization of research, and stock assessment.

HMS activities (Epperly)

Observer training (Belskis)

Ongoing training is conducted for permitted research biologists and fishery observers for many programs, including: NOAA Fisheries Mississippi Laboratories: Harvesting Systems and Resources Surveys Programs (Mitchell), Pelagic Longline Fishery Observer Program (Lee), Southeast U.S. Shark Drift Gillnet and Bottom Longline Fishery (Carlson), Reef Fish Bottom Longline Fishery (Mote Marine Laboratory), and Smalltooth Sawfish Research (FWCC/FMRI).

Observers receive training to accurately complete the Sea Turtle Life History Form to collect data about the sea turtles and capture gear interaction. The current version of the observer form and manual, and other reference materials can be found at
http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp

Training (1-2 days), including videos, presentations, handouts and the observer manual, covers: species identification, marking and sampling techniques (flipper and PIT tagging, and biopsy collection), measurements, photos, anatomical features of the oral cavity and use of tools listed in the SEFSC NOAA Technical Memorandum #524, "Careful Release Protocols for Sea Turtle Release with Minimal Injury". Hands on sessions review all aspects including the use of dehookers (tested on a cardboard box), turtle tether, and line cutters. A live turtle, under the supervision of animal care personnel, is used for the observer to practice working up a turtle from the time it comes on board to release. The live animal also allows the observer to become familiar with general turtle behaviors and use of mouth opening and mouth gag tools and techniques. Resuscitation technique of comatose animals, the importance of sterile technique after encountering an animal displaying evidence of fibropapilloma, and safety are emphasized. Training in the future will likely include a brief introduction on dissection techniques.

Observer Support and Database Management (Stokes)

Besides training observers, we provide equipment and supplies to the pelagic longline fishery and provide updated data forms and manuals and sources of equipment and supplies to the other fishery observer programs. Data collected by observers are entered, error checked, and summarized into annual take tables (quarterly for pelagic longline fishery) which quantify and describe protected species bycatch in the pelagic longline, shark bottom longline, and shark gillnet fisheries. These tables are used to generate annual bycatch estimates for protected species in the fisheries. We also provide SERO with quarterly mortality rates for the longline fisheries.

Loggerhead Oral Cavity Morphology and Relationship to Fish Hook Ingestion (Stokes)

To further understand interactions between incidentally captured sea turtles and pelagic longline fishing gear, we are investigating the morphometric parameters and ontogeny of the oral cavity in loggerheads. Of particular interest is how these measures relate to the hook sizes fished in these fisheries.

We have performed a series of repeated measures, both standard and specific to the oral cavity, on captive loggerheads at the Galveston Laboratory (n = 30) at 45cm, 55cm, and 65cm standard straight carapace length (SCL), spanning the range of turtle size classes most often captured in western North Atlantic Ocean pelagic longline fisheries. Wild and captive turtles (n = 134),

ranging in size from 35cm - 80cm SCL, have been measured in a non-repeated measures study. Using a canine mouth gag to hold open the jaws, we take oral cavity measures with inside spring calipers and/or dial calipers.

Measures will be analyzed to investigate oral cavity ontogeny. Hooks used in pelagic longline fisheries will be measured to compare how anatomical characters of the oral cavity relate to hook dimensions. We plan to examine mathematical relationships between standard and oral cavity measures to predict the ability of a known size turtle to ingest hooks. With this knowledge, we hope to prevent future incidental capture and mortality through mitigation measures.

In an effort to develop an empirical understanding of the interaction between sea turtles and baited hooks, researchers from the Miami Laboratory in collaboration with the Pascagoula and Galveston Laboratories, conducted controlled feeding trials in conjunction with the morphometric study. We examined effects of hook and animal size, behavior, baiting type and technique as these relate to loggerhead sea turtles' ability to swallow a baited hook.

Researchers modified 14/0, 16/0, 18/0 and 20/0 circle hooks, removing the barb and wrapping the end to prevent injury, and baited ("single hooked" or "threaded") them with whole squid or sardines. Baited hooks (taken away before ingestion or injury) were offered to captive reared loggerheads (n=30 per size class) in three size classes (45, 55, and 65cm standard SCL). The turtle's reaction was recorded, and trials were videotaped to further elucidate behavioral details of the interaction.

As hook size increased, the potential for full ingestion (and serious injury) decreased. Larger turtles were more likely to attempt ingestion of larger hooks. Bait type and baiting technique also affect the potential for ingestion. Results are likely due to differences in bait texture, shielding effects, and behavioral differences in how turtles respond to different hook/bait combinations. Further research is planned to further define these results.